Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of:

Mitigation of Orbital Debris in the	**)**	
New Space Age	**)**	**IB Docket No. 18-313**
	)	

To: The Commission

COMMENTS OF RADIO AMATEUR SATELLITE CORPORATION

The Radio Amateur Satellite Corporation, commonly known as and hereinafter referred to as AMSAT, pursuant to Sections 1.415 and 1.419 of the Commission's Rules [47 C.F.R. §§ 1.415 and 1.419], hereby respectfully submits comments in response to the *Further Notice of Proposed Rulemaking*, FCC 20-54, 85 FR 52455, published August 25, 2020 (the Further Notice). These comments are timely filed. For its comments, AMSAT states as follows:

I. Background

AMSAT is a scientific and educational non-profit corporation chartered in the District of Columbia in 1969. We design, construct, test, and operate space stations in the amateur satellite service. We also make available a variety of publications, computer programs, educational services, and internet services promoting space science education among radio amateurs and students worldwide.[1] For more background information, refer to AMSAT's previous filings on this rulemaking.[2]

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[1] See www.amsat.org

[2] *Comments of Radio Amateur Satellite Corporation – IB Docket No. 18-313.* Filed 4/5/19. https://ecfsapi.fcc.gov/file/104050260212118/Comments%20of%20Radio%20Amateur%20Satellite%20Corporation%20-%20IB%20Docket%20No%2018-313.pdf, *Reply Comments of Radio Amateur Satellite Corporation – IB Docket No. 18-313.* Filed 5/6/19. https://ecfsapi.fcc.gov/file/10507222902907/Reply%20Comments%20of%20Radio%20Amateur%20Satellite%20Corporation%20-%20IB%20Docket%20No%2018-313.pdf, *Notice of* Ex Parte *Presentation: IB Docket No. 18-313*. Filed 4/9/2020. https://ecfsapi.fcc.gov/file/10409353709408/AMSAT%20ARRL%2018-313%20Ex%20Parte%2004_08_2020.pdf

II. Adoption of an indemnification requirement for amateur space stations would limit the number of organizations able to operate amateur space stations

We appreciate the Commission's flexibility in modifying the original proposed rule to allow the *owner* of an amateur space station to provide the necessary indemnification rather than the station licensee. As discussed in our previous filings, licensees of amateur space stations must be individuals and it is unlikely that an individual would be willing to personally indemnify the United States. Allowing the spacecraft owners, such as AMSAT or another non-profit corporation to indemnify the United States for any costs associated with a claim ensures that this burden will not fall on uncompensated individuals who have no pecuniary interest in the operation of the space stations.

The Commission seeks comment on "how to define 'owner' for the purpose of the amateur rules" and further "how to ensure that the indemnification requirement remains valid in the event that the ownership changes for an amateur space station (Further Notice para. 192). Ownership of an amateur space station can be claimed by a letter from the owner of the space station submitted with the other documentation required for an amateur space station notification. If ownership changes, the new owner should be required to submit a notification to the Commission along with a confirmation of the indemnification arrangement.

However, while this approach may provide sufficient flexibility for non-profit amateur satellite organizations to continue to operate amateur space stations, it will still preclude the operation of amateur space stations by university groups, many of whom are restricted or prohibited from indemnification.[3] AMSAT is currently working with several university groups on payloads for their amateur satellite projects. Adoption of the indemnification requirement would likely result in the cancellation of these projects and the loss of opportunities for the students involved to get real-world experience in designing, building, and launching a spacecraft. We urge the Commission to decline to adopt this provision and seek alternative approaches.

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[3] Ex Parte Filing by University SmallSat Researchers. Filed 4/13/20. https://ecfsapi.fcc.gov/file/10413275002749/2020.04.13%20University%20SmallSat%20Researchers%20Orbital%20Debris%20Ex%20Parte.pdf

III. The Commission should decline to adopt a maneuverability requirement for amateur space stations at this time.

The Commission proposes a new requirement for amateur space stations – that all space stations deployed into in low-Earth orbits over 400 km must "be designed with the maneuvering capabilities sufficient to perform effective collision avoidance throughout the period when the space stations are above 400 km." Most amateur spacecraft designed and launched today are CubeSats. These satellites range in size from 10 cm x 10 cm x 10 cm to 30 cm x 10 cm x 10 cm. The limited volume of these satellites provides limited space to include propulsion systems. Although new developments in electronic propulsion systems for CubeSats show great promise, they are still in the experimental phase. Additionally, they require a great deal of electrical current. Including adequate battery power as well as an electronic propulsion system would leave little room for more advanced communication systems and educational experiments that are in development for amateur spacecraft.

We also note that amateur spacecraft are multi-year projects. For example, AMSAT's Fox-1 series began development in 2009. We are currently awaiting the launch of the final satellite in AMSAT's Fox-1 series, scheduled by the end of the year, over 11 years after the development process began. AMSAT's current series of satellites – GOLF – began development in 2017. Launch of the first satellite in the GOLF series is anticipated in 2022 – five years after development began. Imposition of this requirement would have the effect of limiting satellites currently under development to orbits of 400 km or less. These orbits have limited lifetimes – generally of only one or two years at most – and provided very limited communication ranges and ground access times. For this reason, the focus of AMSAT and other amateur satellite organizations is on higher orbits, including high elliptical orbits and higher low-Earth orbits.

Additionally, most rideshare launches available for amateur satellites target orbits between 500 km and 600 km. Deployment to a 400 km orbit is generally only available from the International Space Station (we also note that ISS deployment results in an orbit slightly over this 400 km standard proposed in this regulation). If the Commission chooses to adopt this provision, it should set a higher threshold orbit, perhaps 600 km. Alternatively, the Commission could choose to implement a maneuverability requirement only for those satellites in orbits that will not naturally decay within 25 years.

Maneuverability also raises concerns about amateur spacecraft control. Due to the nature of the amateur service, control of amateur space stations is carried out by uncompensated volunteers without a pecuniary interest in the operation of the space station. This means that command and control of amateur satellites may not be available on a 24/7 basis. While the space station may have maneuvering capability, we may not be able to guarantee that immediate action is taken on a conjunction notification to initiate a maneuver.

For these reasons, we urge the Commission to decline to adopt this provision at this time. If the Commission chooses to adopt such a provision in this rulemaking, it should set both a higher threshold altitude (such as 600 km) and an effective date at least five years into the future to allow time for the redesign of projects in development to incorporate a propulsion system.

IV. Surety bonds for successful post-mission disposal may be effective for providing flexibility to deploy amateur space stations in orbits that do not naturally decay within 25 years.

Although we note that the Commission has not proposed the modification of Part 97 to add surety bonds for successful post-mission disposal, the Commission seeks comments on the application of this proposal to the amateur service (Further Notice para. 204). In principle, this method could allow AMSAT or other organizations the flexibility to test various deorbit devices in orbits with altitudes that do not naturally decay within 25 years by posting a surety bond. We believe that the formula proposed in the Commission's amendment to Part 25 for NGSO satellite systems is reasonable for amateur operations.

However, the $5,000,000 bond for GSO satellite systems would effectively prohibit the deployment of any amateur spacecraft to geostationary orbit. Should the Commission choose to adopt this process for the amateur satellite service, it should set a lower amount for amateur space stations.

IV. Conclusion

The amateur satellite service continues to provide immense value to the growing field of small satellites. Experiments conducted by amateur satellites have informed and continue to inform the development of the commercial small satellite industry. Additionally, student participation in amateur satellite projects provides both inspiration for all young persons to pursue careers in the commercial satellite industry and practical experience for those careers. A strong and robust amateur satellite service will continue to benefit the public interest and inspire future developments in satellite technology. We urge the Commission to consider the public benefit of the amateur satellite service and avoid implementing regulations that would effectively eliminate the amateur satellite service in the United States and cede our leadership in this sector to other nations.

RESPECTFULLY SUBMITTED,

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